

Sea-level observation with ultra-low power radio telemetry for the last minutes tsunami warning

INOUE, Hiroshi^{1*}

¹NIED

One of the reasons why many people have lost their lives by the Great East Japan Earthquake of March 11, 2011 is that the people could not realize the approaching massive tsunami due to various problems. If accurate information of tsunami, even only several minutes before arrival, was provided to the people, number of casualties would have been smaller. A network of ocean bottom cables and buoys to directly measure the sea level will be deployed along the Japanese coast to improve the early warning system. If tsunami approaching the coast, propagating in bays is monitored in the last some tens of minutes until it hits cities, people would be able to take more appropriate action of evacuation.

For such purpose we have to install tide gauges on near-shore islands, tip of a cape, and along the coast line of a bay. We develop a system which enables such installation using MAD-SS, a very slow but ultra-low power spread spectrum radio developed by Mathematical Assist Design Laboratory. It transmits only 1 byte per second, over the distance of 100km line of sight with only 10mW VHF radio. It can be operated more than several months by a pack of dry-cell batteries or a small solar panel. Unlike using cell-phone system, the radio telemetry is reliable even during a crisis and free of charge. The system consists of a water pressure sensor, a digitizer, and a radio transmitter built in a pipe, and easy to install.

We installed a system for testing at a breakwater on Kamishima Island located at the mouth of Ise-bay to transmit the data to Mie University campus in Tsu city 45 km away. Another system was tested at Hasaki Oceanographic Research Station of PARI, in Ibaraki Prefecture, for the purpose of developing installation method at sand beach, which gives more freedom to the location of installation. Deployment of the systems to Albay Gulf and Manila Bay of the Philippines, and Pandang Island off Padang, West Sumatra Indonesia are planned. Installing the system to Pacific Island Countries will contribute to enhance monitoring capabilities of distant tsunamis for the whole Pacific.

(We are grateful to Prof. Hanazato of Mie University and Dr.Nakamura and Mr. Yanagishima of Port and Airport Research Institute for proving their facilities for the observation.)

